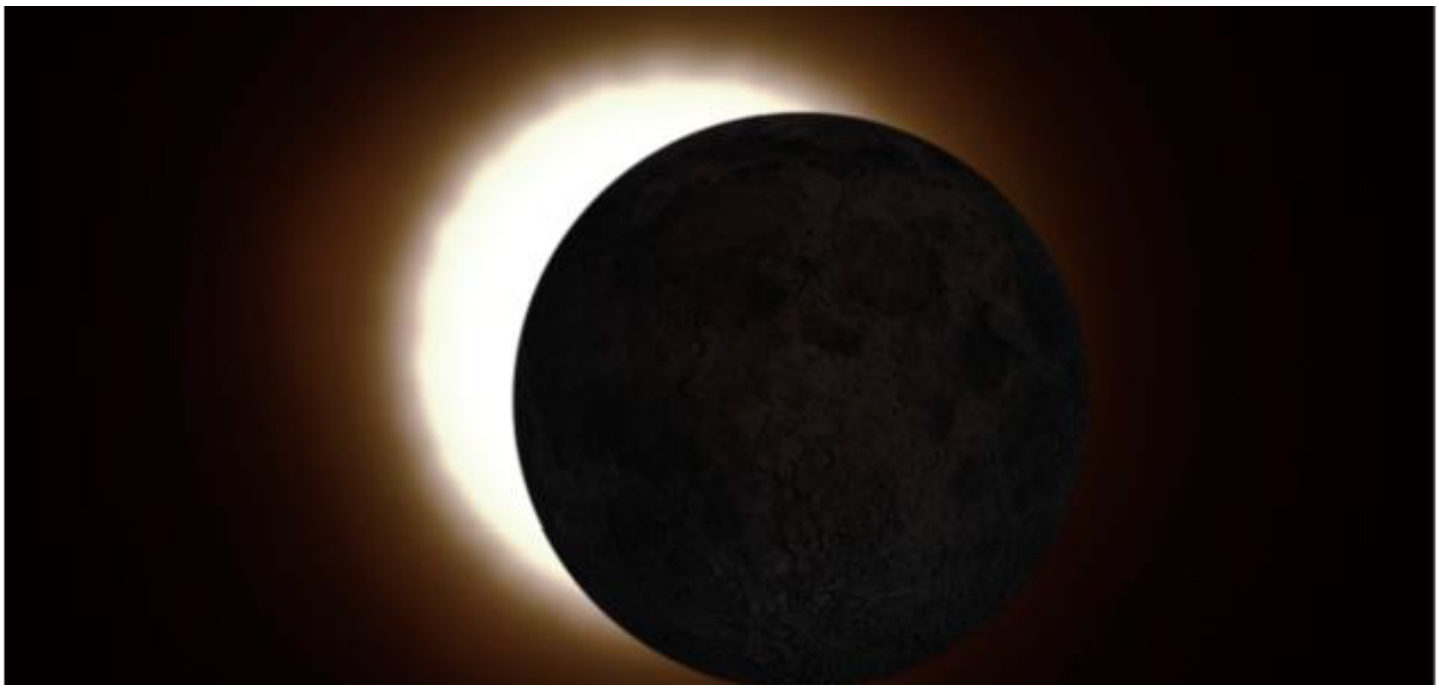
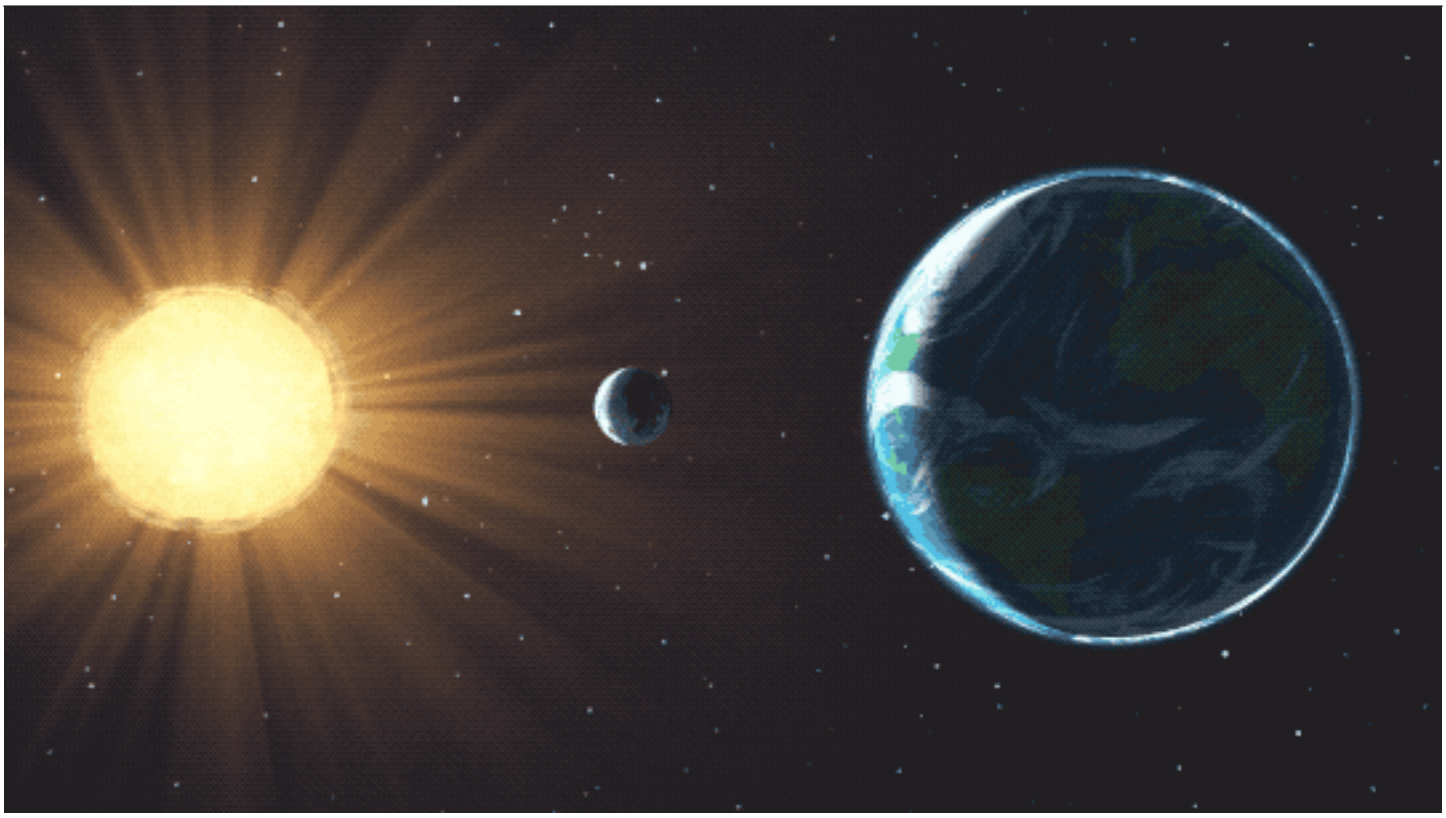
Solar Eclipses: Background Information



Remember to never look directly at the Sun without proper safety equipment.

What is a solar eclipse?

A solar eclipse occurs when the Moon is between the Sun and Earth, and with the right conditions, the Moon casts a shadow on Earth’s surface.

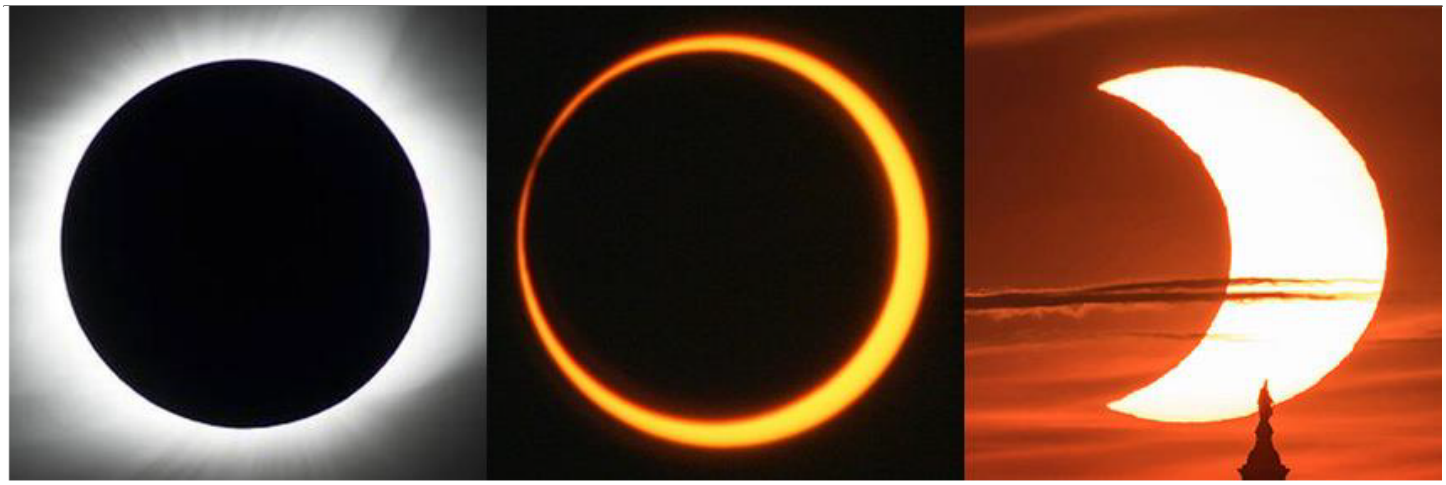


A solar eclipse occurs when the Moon passes between the Sun and Earth, casting a shadow over parts of Earth and blocking the face of the Sun., Credit: NASA's Goddard Space Flight Center, https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/tsis_eclipse-1_0.gif

The phenomenon of a solar eclipse is possible because even though the Sun is about 400 times larger than the Moon, the Sun is about 400 times farther away from Earth than the Moon is. This ratio of the size and distance of these objects makes them appear the same size in the sky.

What are the different types of solar eclipses?

A **total solar eclipse** occurs when the Moon completely blocks the Sun; a **partial solar eclipse** occurs when only part of the Sun is blocked by the Moon. A third type of solar eclipse happens when the Moon is farther away in its orbit around the Earth and appears smaller, only blocking 90% of the Sun’s disk. Although technically a partial solar eclipse, this type of eclipse is called an **annular solar eclipse**.

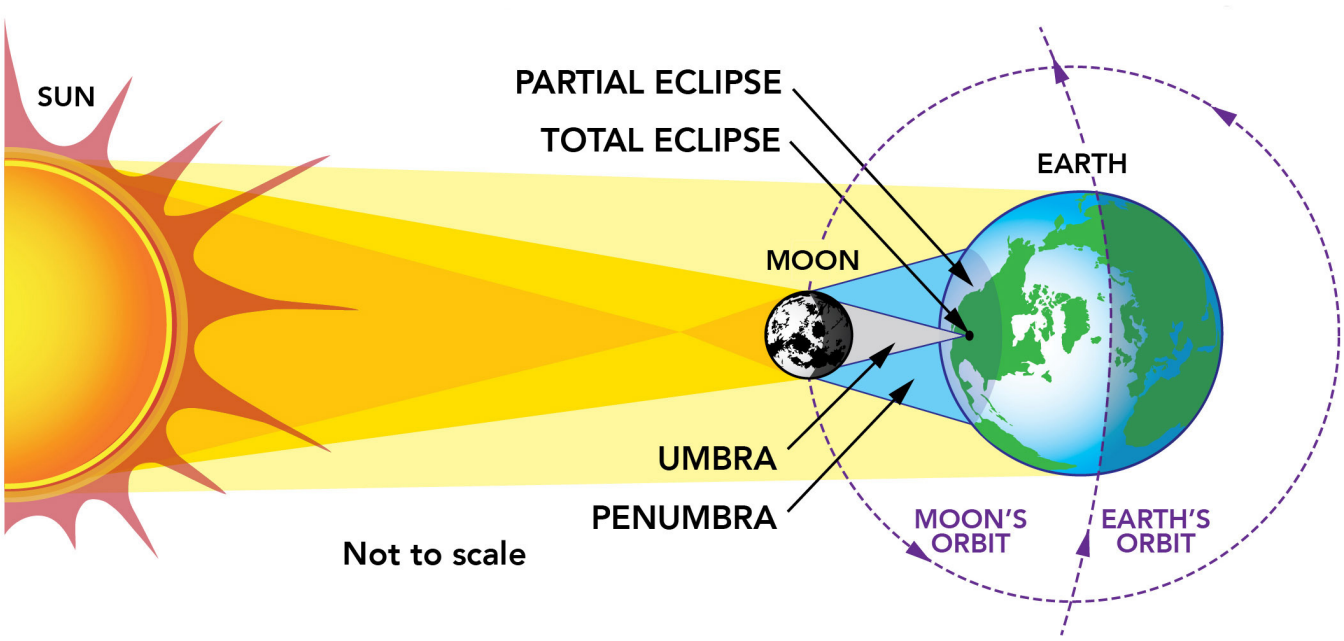


From left to right, these images show a total solar eclipse, annular solar eclipse, and partial solar eclipse. A hybrid eclipse appears as either a total or an annular eclipse (the left and middle images), depending on the observer's location. Credits: Total eclipse (left): NASA/MSFC/Joseph Matus; annular eclipse (center): NASA/Bill Dunford; partial eclipse (right): NASA/Bill Ingalls

https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/Eclipse%20type%20images_3.png

Total vs. Partial Solar Eclipses

The difference between a **total and partial eclipse** is where in the Moon's shadow the observer is located. Observers in the **umbra** shadow will experience a **total solar eclipse**. Observers in the **penumbra** shadow will experience a **partial solar eclipse**. The umbra shadow is much smaller, making experiencing a total solar eclipse more rare.



The Moon's shadow has two parts. The penumbra is the faint outer shadow of the moon. Partial eclipses are seen from within this shadow. The umbra is the dark inner shadow of the moon. Total eclipses are seen from within this shadow. | Credits: NASA's Goddard Space Flight Center | https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/5661_Total_Solar_Eclipse_Shadows_0.jpeg

Total vs. Annular Solar Eclipses

The difference between a **total and annular eclipse** is the distance between the Moon and Earth. The reason that the Moon is not always the same distance from Earth is because the shape of the Moon's orbit around Earth is in the shape of an **ellipse**, or an oval. During a solar eclipse, if the Moon is closer to **perigee**, the eclipse would be total. If the Moon is closer to **apogee**, the eclipse would be annular.

This graphic shows the difference between a Moon at its closest point to Earth, when supermoons occur, and at its farthest. Credit: NASA/JPL-Caltech, https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/perogee%20and%20apogee_2.png

Solar Eclipse Safety

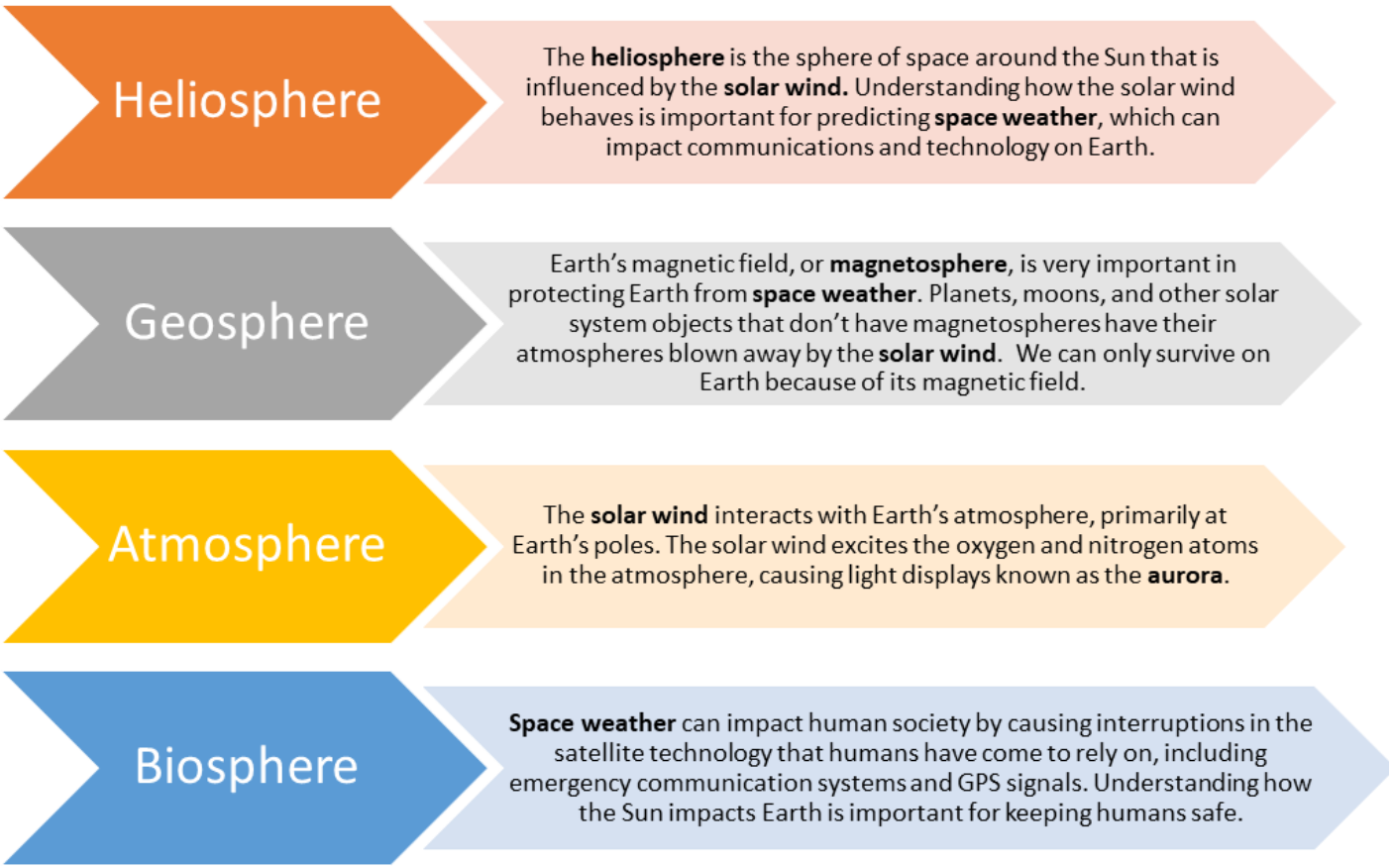
Always use the proper safety equipment to observe the Sun. Solar filters are 1000 times darker than sunglasses and block all infrared and UV light, and nearly all visible light. If you don't have solar eclipse glasses or a solar filter for your telescope or binoculars, there are **indirect ways** to safely observe the Sun, like using a **pinhole projector**.

Eclipse glasses and sunglasses. Sunglasses are not safe to wear to observe a solar eclipse., Image Credit: NASA, https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/eclipse%20glasses%20and%20sunglasses_0.jpg

Solar eclipses can help understand how the Sun impacts Earth Systems

Observing solar eclipses helps scientists learn more about how the Sun creates **space weather**. Space weather is caused by the **solar wind**, which originates from the Sun's atmosphere, the **corona**. Space weather occurs when the solar wind intensifies and can impact

systems on Earth. The corona is usually hidden by the bright light of the Sun's surface, which makes it difficult to see without using special instruments. However, the corona can be viewed with the naked eye **only** during **totality** of a **total solar eclipse.**



CLICK ON IMAGE TO ENLARGE

Space weather from the Sun's heliosphere interacts with Earth's geosphere, atmosphere and biosphere., Credit: NASA, https://mynasadata.larc.nasa.gov/sites/default/files/inline-images/MND%20Graphic%20for%20System%20Science.png

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Sources

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